Hyphenating in Chemical Journals

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INTRODUCTION

Hot water bottle or hot *water bottle*? Which do you mean? Is there any problem with having no hyphen? Is there any confusion? Is it misleading or ambiguous? Does it look strange? No? Then there is no need to hyphenate, simply write *hot water bottle*. But if you specifically mean a bottle for hot (not cold) water or a water bottle that has become hot, you could write *hot-water bottle* or *hot water-bottle* accordingly, although the last example is quite unusual.

The rules for hyphenating compound adjectives are numerous and complex, and although word-processing software will flag or automatically correct some usages, especially when the writer tries to make one word out of a compound still written as two words or perhaps a hyphenated pair, it will miss many others. To complicate matters, English-English and American English follow slightly different rules. The situation is such that hyphenation exists in a near state of anarchy with, for example, some writers and their editors using a hyphen when others do not.

Strunk and White (1979) give an amusing example of this problem:

> The hyphen can play tricks on the unwary, as it did in Chattanooga when two newspapers merged—the *News* and the *Free Press*. Someone introduced a hyphen into the merger, and the paper became *The Chattanooga News-Free Press*, which sounds as though the paper were news-free, or devoid of news.

What about the following, *Satin aluminum finish trim rings*? This example, from the English Forums WebPages (1), can be very confusing unless you know exactly what the object in question is. It turns out that the rings are not made of either satin or aluminum after all and *satin* here refers to the glossiness of the finish of the aluminum color. So, in this case *satin-aluminum finish trim rings* is the clearer phrase since the trim rings have a satin-aluminum finish, keeping in mind that the first word of a hyphenated pair, in this case *satin*, modifies the second word, *aluminum*, not the third word, *finish*.

But how does one decide when to use a hyphen and when to omit them? Little (1996) notes that although the *The Chicago Manual of Style*, usually a very sensible guide to writing, has "… when it comes to hyphens, … left the simple and sensible far behind and given us page upon page of detailed rules and particulars, some of which are contradictory."

The situation becomes even more confusing when we look at examples from authentic texts, and dictionaries only add to the problem as Allsop (1983 p. 303) points out:

> In many cases, the use of hyphens is decided by individual printers or publishing houses, and even dictionaries do not agree on whether for example *dining room* should be written with a hyphen as *dining-room*.

Indeed, a survey of several different chemical journals shows that they do not always follow clear-cut rules found in the dictionary and often contradict each other and even themselves.

CONFUSION ILLUSTRATED

First, there are contradictions. For example, compounds with *-based* are always hyphenated according to the Longman Dictionary of Contemporary English (2003). There is *London-based*, *oil-based*, etc., definite examples of compound adjectives that require a hyphen. On the other hand, in the *Journal of the Japan Petroleum Institute vol. 47* (2), there is a paper, "Hydrogenation of Dicarboxylic Acid Diesters to Corresponding Dialdehydes over ZrO2 Based Catalysts (Part 1) Reactivity of Various Dicarboxylic Acid Diesters", in which *ZrO2 Based* is not hyphenated, ignoring the dictionary's rule. Also, compounds like *single-site catalyst* could be written either way as they are in separate articles on the Internet (3). Similarly, using the dictionary we find *single-minded* but *single track*. And neither is spell-checking software immune to this problem, it faces a similar dilemma. When a compound such as *high performance* is corrected using Microsoft's spell check it is corrected one of two ways, but the dictionary gives it as a hyphenated compound. Other examples show how phrases are written both ways within the same publication and even within the same article. On the NCBI website (4) is a paper entitled "High-Throughput Genomic Sequences" in which the first line of the first paragraph the same phrase is written as *high throughput* without a hyphen.

Some of these contradictions come from the overuse of hyphens. For example, in a paper by Fujita (5) titled "High Performance and Ultra High Molecular Weight Polymers", we find that *Ultra* according to the *Oxford Reference Dictionary* needs a hyphen. So we have "High Performance and Ultra-High Molecular Weight Polymers". To balance we could say "High-Performance and Ultra-High Molecular Weight Polymers". But elsewhere there is the phrase *high performance olefin polymerization catalysts*. A hyphen could be used here but not necessary. So we have *High-Performance* in the title with a hyphen, but no hyphen elsewhere. So we take the hyphen out of the title and have "High Performance and Ultra-High Molecular Weight Polymers". Actually, in American dictionaries (6) *ultra* has no hyphen and is one word so we could have "High Performance and Ultrahigh Molecular Weight Polymers" after

all. However, in the paper and accompanying figures we have the abbreviation UHMWP with no hyphens and *ultra high* as two words and not written as one word as in UhMWP or UMWP (both implausible), so perhaps we should take our cue from living examples found in the chemical journals (7) which uses *ultra high* as two words un-hyphenated ignoring the advice of some dictionaries.

In a paper in *Macromolecular Rapid Communications vol. 24* (8), there is the following sentence:

> The temperature dependence of the structure of either cross-linked or non-cross-linked ultra-high-molecular-weight polyethylene (UHMWPE) fiber compacts was studied by synchrotron microbeam wide-angle X-ray scattering (WAXS), focusing on the fiber-fiber interface.

Now, are all these hyphens necessary? *Wide-angle* and *X-ray* are OK of course, as is *Cross-linked*, although it could be written as *crosslinked* as it is in the same journal in another article entitled "Crosslinked Poly(amido-amine)s as Superior Matrices for Chemical Incorporation of Highly Efficient Organic Nonlinear Optical Dyes" (9). *Non-cross-linked* has a hyphen too many if you follow the rule that the first word modifies the second not the third, so it should be *non-cross linked*. However, if you must hyphenate a prefix to a two-word compound as the ACS Style Guide (1997) suggests then you can keep *non-cross-linked* as originally written if you were intending to say *non-crossed-linked polyethylene,* where the noun being modified comes directly after the unit modifiers, or even *non-crossed-linked and ultra-high molecular weight polyethylene,* where the noun being modified is indirectly connected to the first set of unit modifiers but comes at the end of all the unit modifiers in total. You could also be led to believe that *Noncross-linked*, or *Non-crosslinked*, and *Noncrosslinked* were possible solutions. *Ultra-high* or *ultrahigh* is as we have said above, but no hyphen is needed in *high molecular weight*. That having been said, the ACS Style Guide (1997) does recommend to hyphenate unit modifiers of three or more words like *high-molecular-weight polymers*, so *ultra-high-molecular-weight polymers* is possible.

The same logic would seem to apply to the term *mono-ligated complex* becoming *mono-cyanide-ligated complex* and then *mono-cyanide-ligated ultra-high-molecular- weight complex*. The spanner in the works here though is that according to the ACS Style Guide (1997) you are advised not to hyphenate multiplying prefixes like mono. Thus the options are *monoligated complex*, *monocyanide-ligated complex*, *monocyanide-ligated ultrahigh -molecular-weight complex.*

Nano is another illustration of a prefix in flux. If, as was suggested above, we take our cues from the journals then it would be novel indeed to copy the example of NanoEffect (10) to get *UltraHigh* and thus by extension justify UHMWP or UHMWPE. *Nanoeffect* is one

word unhyphenated (11) as are the following: *nanostructured*, *nanodispersion*, *nanocapsules*, and *nanospheres* (12). And whilst the word like *nanocomposite* remains as one word, *nano particles* and *nano powder*, for example, exist on the Internet as two words sometimes hyphenated or also as one word (13).

Nonetheless, despite their editorial guidelines, journals themselves do not always offer consistent examples. In the *Journal of Polymer Science vol. 42* (14), you can read an article titled "Soluble, Saturated-Red-Light-Emitting Poly(p-phenylenevinylene) Containing Triphenylamine Units and Cyano Groups" and then later in the that Journal (15) "Synthesis and Characterization of New Light-Emitting Copolymers in Polymeric-Light-Emitting-Diode Device Fabrications". If one editor accepts *Red-Light* should not he also accept *New-Light*? In any case, *Polymeric-Light* does not need a hyphen, nor does *Red-Light* or *New Light*, only *Light-Emitting* does.

Furthermore, hyphens sometimes move about or disappear altogether. In the term *Ligand Oriented Catalyst* it is possible to place a hyphen between *Ligand* and *Oriented* as in *Ligand-Oriented Catalyst*. However, if this term is lengthened into the phrase *Ligand-Oriented Catalyst Design*, is the hyphen still required? What about, *Ligand-Oriented-Catalyst Design*? Probably better to drop the hyphens and have *Ligand Oriented Catalyst Design*, it is less confusing but ignores the common practice of hyphenating terms like *well-studied*, though do not hyphenate this term when using the word *very* as in *very well studied*.

A similar case exists with the phrase *end-functionalized polymers*. Here the hyphen is well employed, but when we lengthen the phrase to *chain-end functionalized polymers*, the hyphen is transferred and *end functionalized* loses its hyphen. But it is not clear whether it is *chain-end* or *chain end* because on the Internet you can see *chain-end groups* and *chain end groups, chain end-groups* and *chain end groups*.

Despite the style guides with their long, complicated and contradictory rules and guidelines and examples from authentic texts and dictionaries which are often ignored and replaced with over- or under-hyphenation, inconsistency, confusion, ambiguity, and doubt, it is possible to make some sense of hyphenation with a few rules of thumb and a bit of knowledge about common practice in writing.

TOWARDS RULES OF THUMB

The Chicago Manual of Style (2004) homepage gives this following advice about hyphens:

> Obviously, the hyphenation of compounds is far too complex and fluid to be strictly covered by a set of rules. Check Webster's, and if the compound isn't there, then consider whether a hyphen is needed in order to avoid confusion. If

it's not, then omit the hyphen.

Little (1996) goes further and suggests, "a laid-back approach [which] says simply to follow a good dictionary, and otherwise leave all compounds open unless confusion would result." Although this still leaves much room for confusion as evidenced by the many questions submitted to the help pages of the CMS website, these rules of thumb would help settle most questions about hyphenating compound adjectives.

Furthermore, some generalizations can be made about the use of hyphens. Consider these other examples taken from technical journals:

High- is often hyphenated, as in *high-pressure*, *high-energy*, *high-density*, *high-temperature*, but *high efficiency* and *high performance*, two common compounds, are not always hyphenated.

-er –ly as in high*er* and high*ly* or new*ly* or new are not hyphenated, for example *axially ligated complexes* is not hyphenated.

Low- is often hyphenated, as in *low-pressure, low-temperature*, but *low shear viscosity* is not hyphenated.

Well- is hyphenated, and *well-defined* is optionally hyphenated.

-ed is hyphenated, as in *helium-filled*, *olefin-based, nitroxide-mediated*, *alkene-substituted*, *E last-inserted state*, *photo-operated*, *terpyridine-modified terpolymers*, *IR-induced*, *the above-mentioned*, *ozone-promoted*, etc., but *vinyl terminated oligomer* is not always hyphenated.

-ing is hyphenated, as in *long-lasting*, *heteroatom-containing, anionic ring-opening polymerization*, but scientific compounds such as *carbon monoxide poisoning* are not hyphenated.

Full- is hyphenated.

Free- is sometimes hyphenated, for example, *free radical* or *free-radical* are both possible.

Half- is sometimes hyphenated.

All- is always hyphenated.

-like is hyphenated, for instance, *ladder-like*.

Likewise, the following prefixes are, generally speaking, hyphenated: ex-, un-, co-, pro-, pre-, non-, self-, sub-, infra-, hyper-, post-, anti-, re-, macro-, micro-, inter-, intra-, supra-, ultra-, mid-, semi-, quasi-, off-, in Britain or the colonies that is! In America they are not always hyphenated, sometimes they exist as one word.

In addition, there are some common phrases that often occur as hyphenated groups: *face-to-face, trial-and-error, brother-in-law.* And when numbers are written out, they are

hyphenated as in this example from Roberts (16): *A four-and-a-half-ton satellite*. Rules for hyphenating numbers, however, are covered thoroughly and with no ambiguity in most grammars including *The Chicago Manual of Style.*

Finally, consider whether the following is one word, a hyphenated word, or two words? There is *start-up* or *startup* used as a noun or adjective, but it's *start up* or *startup* when used as a verb. In other words, some words as nouns or adjectives are hyphenated but as a verb they are not. Other words in this class include *shut-down/shutdown* and *shut down* used as a noun/adjective and verb respectively; *set-up/setup and set up*, and *back-up/backup and back up,* depending on the meaning.

There are also rules for hyphenation and capitalization. Do you write *Scaleup of Agitated Thin-film Evaporators* (17), or would you capitalize the *f* in film to be *F* as in *Film* so you would have *Scaleup of Agitated Thin-Film Evaporators*? Look at this mix of titles again from *Steven Bell's Presentation Page: A Collection of Conference Presentation Materials* (18): "Migrate faculty to e-selection tools", "E-selection tool demonstration", "E-selection Advantages", "Migrating to E-Selection", "Stop Sending Those Cards: Equipping Faculty With E-selection Tools for Collaborative Collection Management". The author uses a mixture of *e-selection* (which is correct), *E-selection* (also correct), *E-selection* (*E-selection Advantages* is possible but *E-Selection Advantages* would be better), *E-Selection* (correct balance with the capital *M* in *Migrating*), *E-selection* (when all other words are capitalized except the word *for*, *E-Selection* would be better). By and large, the author has mixed different types of hyphenation-capitalization. The effect is rather disconcerting. I propose the following rules:

- For **CAPITALS OF EVERY LETTER** write *THIN-FILM*.
- For **C**apitals **F**or **T**he **F**irst **L**etter **O**f **E**ach **W**ord write *Thin-Film*.
- For, **C**apitals for **F**irst, **L**ast, and all **I**mportant **W**ords write *Thin-F/film*.
- For **C**apitals only for the first word including tables, etc., say, *Thin-film*.

CONCLUSION: DON'T PUSH THE PANIC BUTTON JUST YET

Despite the contradictions of hyphen use found in prescriptive grammars, dictionaries, and authentic texts and their over-use and tendency to disappear or move about within phrases, sense can be made of them and there is no need to panic when deciding if a hyphen is needed or not. Use a dictionary, use common sense to avoid confusion and over-hyphenation, and become aware of the editing practices used by different publishers by looking through some examples. The last can be quite a bit of hard work, but it will pay off in confidence later when proofreading technical articles.

Footnotes

(1) EnglishForums.com (2003) Thread: “Hyphenating adjective/noun phrases” http://www.EnglishForums.com/showPost.asdx?PostID=16009

(2) *Journal of the Japan Petroleum Institute*, *Vol. 47*, No. 5, (2004).

(3) see the article http://www.gasandoil.com/goc/features/fex84757.htm on *Alexander’s Gas and Oil Connections* gasandoil.com, and on *Trends in Plastics* plastictrends.net/ the article http://www.plastictrends.net/articles/singlesitecatalyst.htm

(4) The National Center for Biotechnology Information (2003) *High-Throughput Genomic Sequences* http://www.ncbi.nlm.nih.gov/HTGS/

(5) Fujita, Terunori et al, (2002) "A Bis(phenoxy-imine)Zr Complex for Ultrahigh-Molecular-Weight Amorphous Ethylene/Propylene Copolymer", *Macromolecular Rapid Communications*, 23, 693-697.

(6) See for example *Miriam-Webster Online* at http://www.m-w.com/

(7) *Goodfellow Catalog*, (ND) “Material Information Polyethylene- Low Density LDPE.” http://www.goodfellow.com/csp/active/static/E/ET31.HTML

(8) *Macromolecular Rapid Communications vol. 24*, (2003) page 1150

(9) *Macromolecular Rapid Communications vol. 24*, (2003) page 1091

(10) see, NanoEffect.com

(11) at nonoeffect.iscool.net

(12) at http://www.google.co.jp/search?hl=ja&ie=Shift_JIS&q=nanodispersion&Ir=

(13) for example at http://www.google.co.jp/ search?hl=ja&inlang=ja&ie=Shift_JIS&q=nano+particles&Ir=, but one word at http://www.google.co.jp/search?hl=ja&ie=Shift_JIS&q=nanocomposite&Ir=, a website search list that uses the term nano technology as two words in the same breath as it talks about "...Imperm?: an ultra high barrier nanocomposite plastic..." where nanocomposite is one word and ultra high is kept separate.

(14) *Journal of Polymer Science: Part A: Polymer Chemistry, Vol. 42*, (2004) page 3947

(15) *Journal of Polymer Science: Part A: Polymer Chemistry, Vol. 42*, (2004) page 3954

(16) Roberts, JM (1992) *The Penguin History of the World*, Penguin Books, London. p. 980

(17) *Chemical Engineering* April (2004) page 55.

(18) Bell, Steven (2000) *Steven Bell's Presentation Page: A Collection of Conference Presentation Materials* http://staff.philau.edu/bells/webpresent.html

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The University of Chicago Press Online. *Chicago Manual of Style.* (2004). "New Questions and Answers." [WWW Document] URL http://www.press.uchicago.edu/Misc/Chicago/ cmosfaq/cmosfaq.html